BWXT Pantex

Overview of Pantex's Chemical Management and Hazards Analysis Methods

Barry Hill

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Why?
  - Classify facilities
  - Worker Safety
  - Determine potential effect on other facilities/operations
  - Determine potential offsite effects

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Tools/Programs
  - Preliminary Hazards Analysis
  - FSAR Analyses
  - Process Hazards Analyses (PHAs)
  - Management of Change Program
  - Job Safety and Health Analyses (JSHAs)
  - Activity Hazards Analyses/Screens

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Tools/Programs (continued)
  - Work order performance reviews/pre job site inspections
  - Emergency Hazards Assessment
  - Chemical Control Committee
  - ES&H Centralized Review of Procedures
  - Pre-startup reviews

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Preliminary Hazard Analysis
  - Conducted prior to construction (after title 1)
  - Performed by a Project Engineer and Risk Management Professional

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- **Preliminary Hazard Analysis**
  - CHEMICAL/RADIOACTIVE INVENTORIES
    - Requires Listing all chemicals, explosives and radioactive materials and their quantities, that are to be associated (directly and indirectly) with the facility
    - 29 CFR 1910.119, Appendix A, "Highly Hazardous Chemicals, Toxics & Reactives List (HHS)"
    - 40 CFR Part 355 Appendix A "Extremely Hazardous Substance List (EHS)
  - Determines analysis requirements and classification of facility as either Nuclear, Non-Nuclear PSM Covered, or General Industrial

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Analysis To Support FSAR
  - Performed per 10 CFR 830 and DOE Std. 3009.94
  - Specific Hazards Analysis Completed to Support Authorization Basis of Nuclear Facilities
    - Examples:
      - Chlorine release from water treatment plant

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Process Hazards Analysis (PHA)
  - Per Requirements of DOE Explosives Safety Manual and 29 CFR 1910.119, "Process Safety Management"
  - Focuses on processes and worker safety
  - Program implemented after cancellation of 5481.1B
  - Performed on all Explosive Manufacturing Processes

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- **Process Hazards Analyses**
  - Performed for Non-explosive Chemical/Waste facilities as Best Business Practice (BBP)
  - 57 PHAs Completed to date, approximately 20 remaining
  - Examples:
    - Explosive Synthesis (multiple facilities)
    - Hazardous Waste Treatment and Processing Facility
    - Laboratory Processes
    - Base Hydrolysis of Explosives
    - Solvent Recovery
    - Paint Bay Operations

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Process Hazards Analysis
  - Performed by a team including:
    - Team Leader
    - Facility Manager
    - Operations Supervisor
    - Operations Technician
    - Explosive Safety Representative
    - Industrial Hygiene Representative

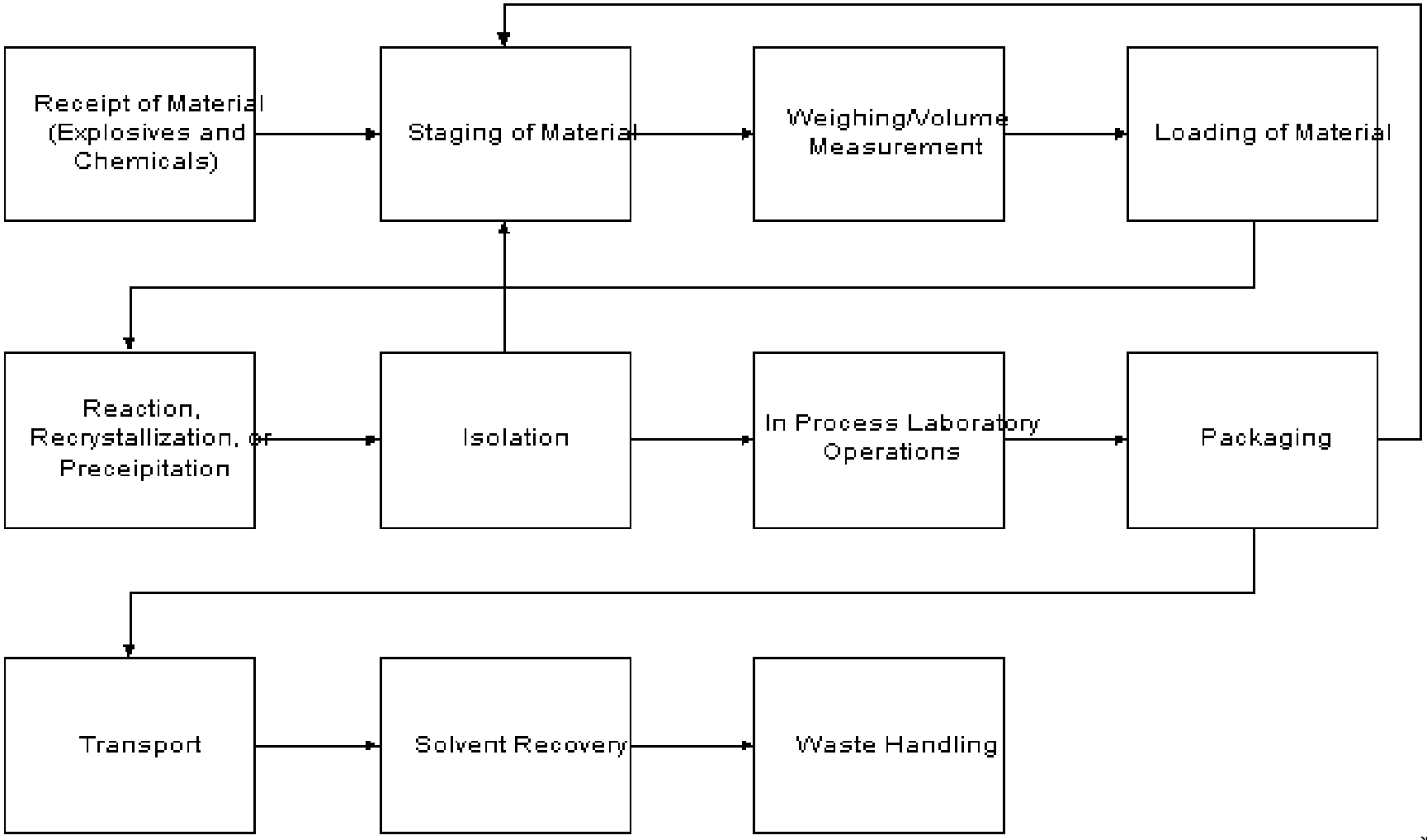
BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- **PHA Generally Includes:**
  - What-if (using detailed process flow)
  - Explosive safety Checklist
  - General industry checklist (including chemical hazards)
  - Previous incident and Lessons Learned review (specific to process)
  - Chemical Review including Haz Com data, physical properties and hazards assignment

BWXT Pantex

Process Flowsheet - Explosive Synthesis in 11-36



BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

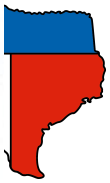
- Process Hazards Analysis
  - Multiple deviations for each process step
    - Examples:
      - Material Staging/Storage:
        - Explosive staging limits exceeded?
        - Flammable/toxic material limits exceeded?
        - Incompatible explosives staged together?
        - Incompatible chemicals stored together?
        - Chemicals improperly stored?:
      - Weighing and Volume Measurement:
        - Wrong quantity of explosive weighed?
        - Wrong type of explosive weighed?
        - Wrong volume/weight of chemical/solvent?

HAZARD COMMUNICATION DATA

Chemical Name	Pantex File No.	MSDS Date	Health	Flammability	Reactivity	Form	Special Info.	Incompatibilities	Compatbility Code
Halthane 73-19 Curing Agent	00898.1	5/3/95	3	0	0	L	SKIN,T-ORG	Strong Oxidizers	F
Helium	00695.3	6/17/99	0	0	0	G	P	N/A	F
HMX, Grade B	01583.1	6/20/91	3	2	4	S	EXP,SKIN	N/A	F
HNS	02411.2	10/2/91	1	1	4	S	SKIN,EXP	N/A	F
Indicator Stop Bath	02136.1	12/17/97	3	0	0	L	SKIN,S,A,T-ORG	Strong Acids, Strong Oxidizing Agent	F
Isopropyl Alcohol	00518.14	6/30/97	2	4	1	L	A^,T-ORG,SKIN,R,S	Acids, Metals, Oxidizers, Combustible Material, Halogens, Peroxides, Bases, Metal Salts	F

CHEMICAL PROPERTIES									
Chemical	Bp °C	Fp/ Mp °C	Vp@ 20 °C	Fp[1] °C	Vapor[2] Density	IDLH/ STEL	LD50	TLV	PEL
LX-07	n/a	n/a	n/a	534-549F (HMX, deflagration)	n/a	n/a	Oral Rabbit: 50 mg/Kg (HMX), Skin Rabbit: 830 mg/Kg	n/a	n/a
LX-10	n/a	n/a	n/a	534-549 (HMX, deflagration)	n/a	n/a	Oral Rabbit: 50 mg/Kg (HMX), Skin Rabbit: 830 mg/Kg	n/a	n/a
LX-13	n/a	n/a	n/a	>212 F	n/a	n/a	Oral man: 1669 mg/Kg 8 year old	5 mg/m3 (sylgard)	5 mg/m3 (sylgard)
LX-17	Decomp. @ 325C	n/a	3.2 mm Hg @ 175 C	n/a	n/a	n/a	n/a	n/a	n/a
Methane	-258.6 F	n/a	n/a	-306 F	n/a	n/a	n/a	n/a	n/a

CHEMICAL HAZARD ASSIGNMENT					
Chemical	**Acutely Toxic**	**Chronically Toxic**	**Flammable**	**Combustible**	**Unstable, shock sensitive**
Acetone		X	X		
Argon*					
Baratol		X		X	X
Cyclotol		X			X
Developer D-19	X	X			
Dimethyl Sulfoxide (DMSO)		X		X	
DK-50 Developer Part A		X			
DK-50 Developer Part B		X			
Eastman 910	X			X	



BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Management of Change Program
  - 29 CFR 1910.119 Requirement
  - All Process Changes to non-nuclear PSM facilities

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Job Safety and Health Analysis
  - Departments performed 2/month until all hazardous jobs analyzed
  - Performed after accidents
  - Formalized in Plant Procedure
  - Lead by line supervision
  - Includes involved employees
  - Includes appropriate safety support

BWXT Pantex

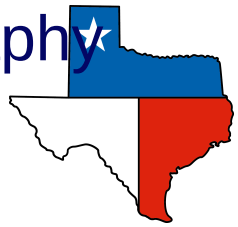
Pantex's Chemical Management and Hazards Analysis Methods

- **Job Safety and Health Analysis**
  - Requires Employee and Supervision Approval
  - Reviewed by OS&H when completed
  - Reviewed every 3 years
  - Methodology
    - Breakdown of the job into basic steps
    - Identification of hazards and potential accidents
    - Required and/or proposed Personal Protective Equipment
    - Development of proposed actions and solutions

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Job Safety and Health Analysis
  - Approximately 1500 performed since 1995
  - Approximately 300 or more have involved chemical handling
  - Title Examples
    - Coating contacts with Mercury
    - Anodizing Aluminum
    - Mix photo developing chemicals
    - Analysis of Explosives by Liquid Chromatography



BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Activity Hazards Analysis Screens For Maintenance work
  - Performed by PM Specialist/Planner during walkdown of the work order
  - Checklist format

Item	Worker Hazards - Does the work involve any of the following:	No	Yes	Unknown
1	**Ionizing Radiation** (handling radioactive material, entry into posted radiological areas, working with or near radiation-producing devices)			
2	**Worker Exposure** (working with or potential exposure to nonionizing radiation, noise, chemicals, hazardous biological materials, lead, asbestos, PCBs)			
3	**General Environment Hazards** (temperature/humidity extremes, poor lighting, cramped conditions, wet/slick locations - consider if use of electrical equipment is required)			
4	**Energized/Operative Systems** (working on or near energized electrical systems, or on or near explosive materials; or working on or with gas, water, stream, pressure, air, sewage, cryogenic systems or waste-line; unprotected belts, pulleys, chains, or rotating equipment, fuel-fired equipment other than vehicles; lasers or spark or flame-producing operations)			
5	**Confined Space** (entry into tanks, manholes, cooling towers, sumps, pits, trenches)			
6	**Excavations or Penetrations** (indoor or outdoor excavation; soil disturbance; or ceiling, floor, wall or roof penetration)			
7	**Material-Handling, Heavy Equipment** (working with or near operating cranes, hoists, rigging equipment, forklifts or heavy equipment)			
8	**Material-Handling, General** (sharp objects/edges, falling objects, pinch points, manual lifting/maneuvering of heavy objects)			
9	**Tools and Equipment** (powered hand tools, powder actuated tools, heat producing tools, use of electrical equipment in NEC hazardous classified locations)			
10	**Elevated Work Surfaces** (ladders, lifts, platforms, scaffolding, roofs or unguarded elevated surfaces)			
11	**Ultraviolet Detectors** (required to be turned off for maintenance)			
12	**Other Environmental or Safety Concerns**: (Describe)			
13	**Special Training, Escort or Access Requirements:**			
14	**Additional Information For Items #1 through #13 (if needed):**			

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Activity Hazard Analysis for maintenance activities
  - Similar to JSHA
  - Also performed by planners/schedulers

Activity Hazard Analysis

☐ W/O Specific ☐ Generic/Recurring W/O

W/O #:	AHA Title:	Completed By:
AHA #:	Date:	
Description/Scope of Work:		

Principal Work Steps	ES&H Hazards	Hazard Controls	Permits	Training

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Work Order Performance Reviews
  - Performed for each task by the Supervisor
  - Pre-job review with workers including:
    - Review of Job Safety and Health Analysis
    - Hazards
    - PPE
    - Precautions/limitations
    - Required steps, etc.
  - Includes Pre work site safety review

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Chemical Control Committee
  - All purchase of new chemicals are required to be approved by Chemical Control Committee
  - Committee consists of the following functional personnel as a minimum:
    - Industrial Hygiene
    - Fire Protection Engineering
    - Fire Department
    - Waste Management
    - Environmental Protection

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Emergency Hazards Assessment
  - For Chemicals that exceed threshold quantities (29 CFR 1910.119 and 40 CFR 335)
  - Includes:
    - Hazard Identification and Characterization
    - Development of Accident scenarios
    - Consequence analyses (airborne dispersion)

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- ES&H Centralized Review of All New Procedures
- Pre-startup reviews of new processes
  - Per requirements of PSM

BWXT Pantex

Pantex's Chemical Management and Hazards Analysis Methods

- Future
  - Implementation of Behavior Based Safety
    - Critical Behavior Inventories / Checklists (will include chemical handling, etc. for certain areas)
    - Goal of 1 task observation per employee per month = 3000 task observations/month)